

WHAT IS CLAIMED IS:

1. A light pen comprising:

a body;

5 a photo detective module that is configured to detect a first light inputted from an external source to output a sensing signal, the photo detective module being disposed in the body;

a control module that is configured to output a control signal in response to the sensing signal; and

10 a light generating module that is configured to receive a driving power signal in response to the control signal to generate a second light.

2. The light pen of claim 1, wherein the light generating module further includes a light emitting diode for generating a white light.

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3. The light pen of claim 1, wherein the photo detective module includes a photo transistor or a photo diode.

20 4. The light pen of claim 1, wherein an end of the body includes an opening through which the second light exits.

25 5. The light pen of claim 1, wherein the light generating module includes one selected from the group consisting of a first light emitting diode for generating the second light having a first wavelength corresponding to a red visible light, a second light emitting diode for generating the second light having a second

wavelength corresponding to a green visible light, and a third light emitting diode for generating the second light having a third wavelength corresponding to a blue visible light.

5 6. The light pen of claim 5, wherein the light generating module includes the first light emitting diode, the second light emitting diode and the third light emitting diode.

10 7. The light pen of claim 6, wherein the control module applies the driving power signal to the first, second and third light emitting diodes by different cycle period each other, alternatively turns on or turns off the first, second and third light emitting diodes so that the light generating module generates the second light.

15 8. The light pen of claim 1, wherein the light generating module is covered by a light concentrating cover for concentrating the second light.

9. The light pen of claim 8, wherein an inner surface of the light concentrating covers includes a light reflection layer.

20 10. The light pen of claim 1, wherein an end of the body includes an opening through which the second light exits, the opening includes a tip having a cylinder flange shape, the tip comprises an elastic member and a switch, the switch applies an operation signal to the control module in response to the movement of the tip.

11. The light pen of claim 1, wherein an end of the body includes an opening through which the second light exits, the opening includes a transparent light concentrating member for concentrating the second light.

5 12. The light pen of claim 11, wherein the light concentrating member has a polypyramid shape.

13. A light pen comprising:

a body;

10 a driving pulse generating module that is configured to generate a first driving power pulse having a first frequency during a first time period and a second driving power pulse having a second frequency during a second time period, the driving pulse generating module being disposed in the body; and

15 a light generating module that is configured to generate a first light in response to the first driving power pulse and a second light in response to the second driving power pulse, the first light flickering at a third frequency, and the second light flickering at a fourth frequency.

20 14. The light pen of claim 13, wherein the first and second frequencies respectively have a frequency except a commercial power frequency.

15. The light pen of claim 13, wherein the driving pulse generating module generates alternately the first driving power pulse and the second driving power pulse.

16. The light pen of claim 13, wherein the light generating module includes a light emitting diode or a semiconductor laser beam generator.

17. A light pen comprising:

5 a body having a first end and a second end; and

a light guiding unit, coupled to the second end of the body, for guiding a first light generated from an external source toward the first end of the body.

18. The light pen of claim 17, wherein the light guiding unit includes an

10 optical cable comprising an optical fiber.

19. A liquid crystal display device comprising:

a light pen including:

15 a body;

a photo detective module that is configured to detect a first light inputted from an external source to output a first sensing signal, the photo detective module being disposed in the body;

20 a control module that is configured to output a control signal in response to the first sensing signal; and

a light generating module that is configured to receive a driving power signal in response to the control signal to generate a second light;

a liquid crystal display panel including:

25 a first substrate;

a second substrate facing the first substrate;

a liquid crystal layer interposed between the first substrate and the

second substrate;

a plurality of first electrodes disposed on the first substrate;

a second electrode disposed on the second substrate; and

a photo detective element that is configured to detect the second
5 light to output a second sensing signal having a position information, the photo
detective element being disposed between the first electrodes, the position
information having a position to which the second light is incident; and

a driving module that is configured to generate first and second driving signals,
the first driving signal being applied to the first and second electrodes so that the
10 liquid crystal display panel outputs the first light, and the second driving signal being
applied to the first and second electrodes in response to the second sensing signal
so that the liquid crystal display panel outputs a third light.

20. The liquid crystal display device of claim 19, wherein the liquid
15 crystal display device further includes a lamp assembly having a lamp and an
inverter, the lamp and the inverter face the first substrate, the inverter supplies a
power signal to the lamp, and the driving power signal is supplied by the inverter.

21. A liquid crystal display device comprising:

20 a light pen including:

a body;

a driving pulse generating module that is configured to generate a
first driving power pulse having a first frequency during a first time period
and a second driving power pulse having a second frequency during a
25 second time period, the driving pulse generating module being disposed in

the body; and

a light generating module that is configured to generate a first light in response to the first driving power pulse and a second light in response to the second driving power pulse, the first light flickering at a third frequency, and
5 the second light flickering at a fourth frequency;

a liquid crystal display panel including:

a plurality of pixels that is configured to control a transmissivity of a third light passing through a liquid crystal layer to display an image; and

a photo detective element that is configured to detect a position into

10 which the first and second lights are incident, the photo detective element being disposed between the pixels;

a sensed signal processing unit including a comparator module, the comparator module comparing a first intensity of a first sensing signal with a second intensity of a second sensing signal, the first sensing signal corresponding to a third light inputted from an external source, the second sensing signal corresponding to
15 the first and second lights; and

a driving module that is configured to generate first and second driving signals, the first driving signal being applied to the pixels, and the second driving signal being applied to the pixels in response to the second sensing signal.

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22. A liquid crystal display device comprising:

a first substrate including:

a first transparent substrate having a pixel region;

a pixel voltage supplying part that is configured to output a pixel
25 voltage, the pixel voltage supplying part being disposed in a first portion of the pixel

region;

a detective element that is configured to detect an external signal to output a position signal, the detective element being disposed in a second portion of the pixel region, the position signal having a position to which the external signal is

5 applied;

a color filter disposed in the pixel region;

a pixel electrode that is configured to receive the pixel voltage, the pixel electrode being disposed on the color filter;

a second substrate including:

10 a second transparent substrate facing the first transparent substrate;

a common electrode disposed on the second transparent substrate to face the pixel electrode; and

a liquid crystal layer disposed between the fist and second substrates.

15 23. The liquid crystal display device of claim 22, wherein the pixel voltage supplying part includes:

a plurality of gate lines formed on the first transparent substrate along a first direction;

20 a plurality of data lines formed on the second transparent substrate along a second direction substantially perpendicular to the first direction; and

a plurality of first thin film transistors, each of the first thin film transistors coupled to one of the gate lines, one of the data lines and the pixel electrode.

24. The liquid crystal display device of claim 23, wherein the color filter

25 includes a red color filter, a green color filter and a blue color filter, and edges of the

red, green and blue color filters overlaps each other so as to shield a first light leaking between the pixels.

25. The liquid crystal display device of claim 24, wherein the external
5 signal is a second light, and the detective element includes:

a second thin film transistor that is configured to output a first signal in response to the second light inputted from an external source, the second thin film transistor being coupled to one of the data lines, the first signal being applied to said one of the data lines;

10 a third thin film transistor that is configured to output the first signal supplied from the second thin film transistor in response to a second signal applied to said one of the gate lines, the third thin film transistor being coupled to the second thin film transistor and one of the gate lines;

15 a first sensor line spaced apart from each of the data lines by a first predetermined distance to be arranged in the second direction, the first sensor line being coupled to the third thin film transistor and receiving the first signal to output the position signal; and

20 a second sensor line spaced apart from each of the gate lines by a second predetermined distance to be arranged in the first direction, the second sensor line being coupled to the second thin film transistor .

26. The liquid crystal display device of claim 25, wherein the second and third thin film transistors are disposed in a portion of the pixel region in which the red color filter is disposed.

27. The liquid crystal display device of claim 22, wherein the external signal is a second light, the liquid crystal display device further includes a black matrix pattern being disposed on the pixel electrode and having a lattice shape, the black matrix pattern transfers the second light to the detective element, passes a 5 third light incident into the pixel region therethrough, and shields a fourth light incident from spaces between pixels of the pixel region.

28. The liquid crystal display device of claim 22, wherein the external signal is a second light, the second substrate further includes a black matrix pattern 10 being disposed on the common electrode and having a lattice shape, the black matrix pattern transfers the second light to the detective element, passes a third light incident into the pixel region therethrough, and shields a fourth light incident from spaces between pixels of the pixel region.

15 29. A display device comprising:

a light pen including:

a body;

a photo detective module that is configured to detect a first light inputted from an external source to output a first sensing signal, the photo 20 detective module being disposed in the body;

a control module that is configured to output a control signal in response to the first sensing signal; and

a light generating module that is configured to receive a driving power signal in response to the control signal to generate a second light;

25 a display unit including a plurality of photo detective elements, the photo

detective elements outputting the first light, detecting the second light to output a second sensing signal having a position information, the position information having a position to which the second light is incident;

a driving module that is configured to generate first and second driving signals,

5 the first driving signal allowing the display unit to output the first light, and the second driving signal allowing the display unit to output a third light in response to the second sensing signal.

30. A display device comprising:

10 a light pen including:

a body;

a driving pulse generating module that is configured to generate a first driving power pulse having a first frequency during a first time period and a second driving power pulse having a second frequency during a second time period, the driving pulse generating module being disposed in
15 the body;

a light generating module that is configured to generate a first light in response to the first driving power pulse and a second light in response to the second driving power pulse, the first light flickering at a third frequency, and
20 the second light flickering at a fourth frequency;

a display unit including a plurality of photo detective elements for detecting a position into which the first and second lights are incident;

a sensed signal processing unit including a comparator module, the comparator module comparing a first intensity of a first sensing signal with a second intensity of a second sensing signal, the first sensing signal corresponding to a third

- light inputted from an external source, the second sensing signal corresponding to the first and second lights; and
- a driving module that is configured to generate first and second driving signals, the first driving signal allowing the display unit to output a fourth light, and the second driving signal allowing the display unit to output a fifth light in response to the second sensing signal.

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